Our Docket: 48679-X

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re:

Applicant	: Shihe FAN et al.
Application No.	: 10/726,574
Filed	: December 4, 2003
Title	: METHOD OF EX VITRO SOWING, GERMINATION, GROWTH AND CONVERSION OF PLANT SOMATIC EMBRYOS OR GERMINANTS, AND NUTRIENT MEDIUM USED THERETO
Art Unit	: 1661
Confirmation No.	: 5066
Examiner	: Annette H. Para

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June 16, 2009

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
United States of America

Dear Sir:

REPLY BRIEF UNDER 37 C.F.R. § 41.41

This is Applicant's response to the Examiner's Answer of April 16, 2009.

Remarks commence on page 2 of this paper.

REMARKS

The main position of the Appellant may be summarized succinctly by making the following two points.

(1) It is essential to appreciate that a critical feature of the present invention is that a nutrient medium containing solid particles is used during sowing of embryos/germinants onto conventional soils or soil substitutes to provide continuing physical support to the embryo or germinant to maintain the correct generally upright orientation of the embryo/germinant and growing seedling during the critical phase until the roots anchor the seedling in the soil or soil substitute. This is exemplified in Figs. 1 to 5 of the drawings accompanying the application under appeal. This step is not shown in any prior art document and there is no suggestion or hint that nutrient media may be used in this way. In the present invention, the nutrient medium is not used solely for supplying nutrients, although it also has this function.

(2) From the outset of examination and consistently thereafter no importance has been given to the fact that Fan et al. discloses several steps of a procedure for producing somatic seedlings from somatic embryos whereas the present invention is concerned only with a method of sowing somatic embryos or germinants, i.e. a final step of the procedure. Information from other steps in the procedure has been used to support arguments of obviousness of the claims of the present application whereas, in fact, such other steps are unrelated to those claims. It is only in the final sowing and growing step that upright orientation of the embryo/germinant is important and so continuing physical support is of relevance.

The main section of Fan et al. that relates to the sowing of embryos/germinants is found in Columns 9 and 10. The most relevant part (Col. 9 line 64 to Col. 10 line 5) states:

> "After the pre-germinated somatic embryos are sown onto the surfaces of the rooting substrates, if desired, the embryos may be covered with a thin layer of additional rooting substrate that may be comprised of the same material underneath the embryos or alternatively, with a different type of material. One non-limiting example is sowing the pre-germinated embryos onto PRO-MIX-PGX medium, then overlaying the embryos with a thin layer of coconut husk fibers."

This is not the same as dispensing a quantity of nutrient medium onto the surface of a porous solid growth substrate and contacting the embryo or germinant with the medium, wherein the medium includes a flowable component and solid particles up to 10% (w/v) (Claim 1 of the application). In Fan et al., there is no dispensing of such a medium. The covering of the embryos/germinants in Fan et al. is done after the sowing and anyway involves the use of a particulate solid such as coconut husk fibers (just as conventional seeds are often covered over with a layer of soil or soil substitute). There is no suggestion in Fan et al. that medium used to cover the embryos/germinants should be used to keep them generally upright. Indeed, covering the embryos/germinants with a particulate solid could well tip them over if they happen to be upright when sown.

With these points in mind, the comments made in the Examiner's Answer are addressed in the following.

(9) Grounds of Rejection

Fan et al. in view of Pierik

In section "(9) Grounds of Rejection" on page 3 of the Examiner's Answer the obviousness rejection of most or all of the claims over Fan et al. in view of Pierik was argued as follows (Examiner's comments show in bold and italics):

> ***For claim 1, Fan et al. teach a method of sowing naked heterotrophic ... somatic embryos on a nutrient medium comprising 1-9% of sucrose (column 4, line 10).***

The section of Fan et al. in Column 4, lines 8 to 14 relates to the pre-germination and drying of embryos, not to subsequent sowing of such embryos.

> ***The solid components are but not restricted to vermiculite, perlite, peat (pulp of wood containing alpha cellulose), coconut husk fibers (which are flexible fibbers) and the like (biologically inert) (column 8, lines 50-51).***

The materials of Column 8, lines 50-55 relate to the pre-germination medium and are used to keep the embryos from submergence within the liquid medium but in contact with the medium so that capillary action creates a layer of liquid medium around the embryos. There is no orientation support, except that elongated embryos are likely to lie in a horizontal orientation.

> ***The solid components (discontinuous surface) contain sufficient liquid germination medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos (column 8, lines 52-54).***

The important thing to notice is that the medium is a germination medium. This is not a medium used for the sowing step.

> ***The somatic embryos are sown on the discontinuous surface (column 8, line 49).***

The word "sown" is not used in the indicated line. This passage is still discussing pre-germination.

> ***The embryos are exposed to environmental conditions effective for growth (column 7, lines 63-67).***

This statement implies that the step discussed in the Examiner's previous two sentences involves exposure to conditions effective for growth, but this is not so as the indicated passage relates to a subsequent step of Fan et al. (step 8 of Column 7, following sowing in step 7). The Examiner is inappropriately mixing different disclosed concepts. The previous two of the Examiner's sentences relate to steps 1 and 2 of Column 7 (pre-germination). Steps 7 and 8 concern the same kind of step to which the present invention relates, but they mention only sowing in nursery containers containing a three-phase substrate (solid, liquid and air), i.e. soil or a soil substitute. A nutrient medium is subsequently provided in step 9 (Column 8) but in the form of an aerosol, and as an aerosol and/or liquid suspension and/or liquid solution in step 10. However, the contact is subsequent to sowing and unable to provide continuing physical support.

The sowing and germination steps are carried out* ex-vitro *in non-sterile conditions (column 7, lines 22-25, and abstract, lines 14-17).

This statement is correct.

Fan et al. teach Pro-Mix-PGX medium (porous solid growth substrate) (column 10, line 4).

This has been discussed above. This medium is a soil substitute and is not a "nutrient medium" of the kind defined in the claims of the present application. It may be used to cover the embryos/germinants, but it is not used in the way required by the claims.

Fan et al. teach producing seedlings (young autotrophic plants) from the heterotrophic embryos (abstract).

Correct but not relevant to important steps of the claims of the present application.

Finally, Fan et al. teach growing* Pinus radiate, Pinus teada *(Loblolly pine), and* Picea glauca *(spruce) somatic embryos (conifer species).

No comment.

The prior art teaching of Fan et al. differs from the claimed invention as follows:

For claim 1, Fan et al. fail to teach the content of solids in the nutrient medium to a maximum of 10%. Fan et al also fail to teach nutrient medium comprising gelling agents.

Fan et al. fails to teach a pool of nutrient.

These statements omit the fact that Fan et al. also fail to teach (for claim 1):

1. A nutrient medium for the step of sowing that contains a solid component within a flowable component containing water and a carbohydrate nutrient. The steps of Columns 7 and 8 (particularly step 9) make it clear that the carbohydrate nutrient is applied after sowing as an aerosol (which would not contain a solid).

2. Dispensing a quantity of the nutrient medium onto a surface of a solid porous growth medium and contacting the plant embryo or germinant with the nutrient medium. Step 9 of Column 8 shows that the nutrient medium is applied after sowing.

3. Since there are no particles in the nutrient medium, there is no disclosure of the concept of using solid particles adapted to remain in contact and provide continuing physical support.

In the case of claim 45, Fan et al. also fail to disclose:

4. Particles of a solid contained within a semi-solid component used for the sowing step.

5. Contacting the embryo/germinant with a pool of nutrient medium to maintain a generally upright orientation of the embryo/germinant.

These are all elements that are completely missing from all of the prior art, not just Fan et al.

Accordingly, it is submitted that the Examiner's assessment of the teaching of Fan et al. with respect to independent claims 1, 32 (for the same reasons as claim 1) and 45 is incorrect and deficient.

However,

The percentage of solids in the medium is an optimization of process parameters.

Since Fan et al. does not disclose any solids in the nutrient medium used during sowing, there is nothing to optimize.

The reference does not specifically teach a content of 10% solids in the medium as claimed by Applicant. The percentage of solids in the medium is a clear result of effective parameters that a person of ordinary skill in the art would routinely optimize. Optimization of parameters is a routine practice that would be obvious for a person of ordinary skill in the art to employ.

These statements are meaningless because Fan et al. do not suggest the use of a nutrient medium containing solid particles for the sowing step.

It would have been customary for an artisan of ordinary skill to determine the optimal concentration of solids to help the nutrient to stay in contact with the embryos.

In the claimed invention, the percentage of solids does not affect the way the nutrient stays in contact with the embryos. This is the function of the semi-solid or flowable component. The solids are provided for continuing support once the nutrient component has dissipated.

One would have been motivated to use this percentage of solids in the medium to optimize the surface of the embryos in contact with the nutrient.

The amount of solids has nothing to do with the surface of the embryos in contact with the nutrient. The solids are provided for continuing physical support.

Thus, absent some demonstration of unexpected results from the claimed parameters, the optimization of the content of 10% solids in the medium would have been obvious at the time of Applicant's invention.

For the reasons give above, the Examiner has not made a convincing case for obviousness of the claims. The assessment of the teaching of Fan et al. is incorrect in the important areas and the arguments regarding expected skill and motivation are unsound.

Pierik teaches nutrient media comprising agar to form a gel (page 55).

This is correct, but Pierik is concerned with in-vitro cultivation of plants, i.e. the type of culturing that takes place on solid gelled media in sterile conditions. This is no more relevant to the present invention than the pre-germination step of Fan et al. itself. Pierik has nothing to do with planting embryos/germinants in ex-vitro conditions and holding the embryos/germinants and of providing continuing physical support for such embryos/germinants. The media of Pierik do not include solid particles, but only a gel.

A person of ordinary skill in the art would not see Pierik as relevant either to the invention of Fan et al. or to the invention claimed in the application under appeal.

At the time the invention was made it would have been for one of ordinary skill in the art to modify the method of Fan et al. by adding agar mixed with the nutrient medium knowing that gelling agent serves as binding agent for nutrient and water.

Fan et al. applies the carbohydrate-containing nutrient medium after sowing by via an aerosol (step 9 of Column 8). The preparation of a nutrient solution containing a gelling agent would be assumed to be inconsistent with the production of an aerosol (produced from highly fluid solutions). Step 10 of Column

8 (for applying micronutrients) also mentions liquid suspensions and liquid solutions applied to the surface of the nursery containers. Given that the embryos may be covered with a layer of solid, a person of ordinary skill in the art would not think of using a gelled solution for such a purpose as the gel would not reach the covered embryos.

> ***One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed.***

This is not true if the nutrient and water cannot be made to contact the embryo/germinant, i.e. if the solution cannot be made into an aerosol or if it fails to penetrate a covering layer of solids.

> ***Due to the new viscosity of the nutrient medium one of ordinary skill in the art will have to dispsense it into a depression to keep it from running off.***

Surely, the reverse is true. A viscous medium would not run off. A depression is preferably used in the claimed invention to further assist with the orientation of the embryo/germinant in the generally vertical direction as can be seen from Fig. 3 of the drawings accompanying the application under appeal. This has nothing to do with the viscosity of the medium.

> ***The mixture of liquid nutrient and agar will form a pool of nutrient, providing an immediate support to the somatic embryos to maintain them in an upright growth orientation.***

There is nothing to suggest this in the prior art.

> ***After dissipation of the flowable mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of solid component having a continuing physical support.***

Again, there is nothing to suggest this in the prior art, especially given the lack of teaching of a solid component in nutrient media used during sowing.

> ***Thus, the invention as a whole was clearly prima facie obvious to one of ordinary skill in the art.***

For the reasons given above, this conclusion cannot be justified from the arguments and prior art presented by the Examiner.

Rejection of dependent claims 2-10, 12-20, 23-24, 27, 29-32 and 45 over Fan et al. in view of Pierik

First of all, we would like to point out that, for the reasons given above, all of the dependent claims of this application are believed to be patentable over Fan et al. and Pierik. Therefore, any claims dependent on the independent claims should be considered patentable for the same reasons.

The introductory comments made by the Examiner regarding Fan et al. have been dealt with above. The Examiner then continued as follows.

> ***Somatic embryos can be sprayed with fungicides, bactericides, antibiotics, nematicides, insecticides and the like (column 5, lines 60-62).***

No comment.

> ***Furthermore, Fan et al. teach plant growth regulator (column 4, line 11), mineral compounds, vitamins and amino acids (column 10, lines 45-65).***

There does not appear to be any mention of plant growth regulators at Column 4, line 11. Perhaps the Examiner is referring to ABA, but it should be noted that this part of the description of Fan et al. to pre-germination and not to sowing. Also, it is of note that the Examiner's reference to the text at Column 10, lines 45-65 refers to the application of nutrients, mineral compounds, etc. by means of aerosol.

> ***Fan et al. teach a solid component comprising elongated particles (column 12, line 34).***

This part of Fan et al. mentions that, after sowing, the germinants were covered with a thin layer of coir which no doubt does include elongated particles. However, such particles are not included in the nutrient medium as required in the claims of the application under appeal.

> ***Finally Fan et al. teach growing Pinus radiate, Pinus teada (Loblolly pine), and Picea glauca (spruce) somatic embryos.***

No comment.

> ***When the somatic is sown onto the surface of the absorbent material (column 8, lines 55-58) it creates a depression in the solid surface.***

The text at Column 8, lines 55-58 does not in fact support this conclusion directly. The text states that the somatic embryos can be sown onto the surface of the absorbent material.

The prior art teaching of Fan et al. differs from the claimed invention as follows:

Fan et al. fail to teach nutrient medium comprising gelling agents.

Fan et al. also fail to teach a pool of nutrient.

As pointed out in earlier comments, Fan et al. in fact fail to disclose five additional features, so the Examiner's assessment in this regard is incorrect or deficient.

However,

Pierik teaches nutrient media comprising agar to form a gel (page 55).

Pierik does indeed disclose the use of agar to form a gel. However, as pointed out previously, Pierik is concerned solely with *in vitro* tissue cultures which persons of ordinary skill in the art would recognize as differing considerably from *ex vitro* sowing of embryos/germinants in non-sterile conditions. Agar is often used to form gels in petri dishes used in *in vitro* culturing of tissues and microorganisms. Pierik does not disclose the use of agar to form gels for nutrient media used in sowing for growth into seedlings in non-sterile conditions. Therefore, Pierik does not amount to a disclosure which can be combined with the teaching of Fan et al., at least for the sowing step thereof.

At the time the invention was made it would have been obvious for one of ordinary skill in the art to modify the method of Fan et al. by adding agar mixed with the nutrient medium knowing that gelling agent serve as binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed.

Since Pierik relates to *in vitro* procedures, a person of ordinary skill in the art would not be able to make the assumption that the use of agar or other gelling agent would be effective in *ex vitro* sterile planting conditions. Pierik is intended for laboratory-scale equipment rather than the commercial-style operation of Fan et al. (and the claimed invention). To test this assumption would involve undue experimentation. Moreover, the amount of agar or gelling agent used in the present invention is clearly not sufficient to produce a solid gel since the nutrient medium must be flowable. If it is not flowable, the medium cannot be dispensed onto the soil or soil substitute. Page 56 of Pierik discusses suitable concentration and states:

> "If a lower concentration (0.4%) is used then the nutrient medium remains sloppy, especially when the pH is also low. If a high concentration (1.0%) is chosen, then the nutrient medium is very solid, making inoculation difficult. If 0.6% is used and the medium remains sloppy then the pH should be corrected; if the pH is lower than 4.5-4.8 a medium with 0.6% agar does not gel properly."

Thus, it is clear from this section of Pierik that the intention is to produce a medium that is neither "sloppy" nor solid. In the claimed invention, a medium that could be described as "sloppy" is intended as it must be flowable. Therefore, if this interpretation of Pierik is correct, Pierik teaches away from the present invention by disclosing media that are not "flowable".

> ***Due to the new viscosity of the nutrient medium, which can be dispensed under gravity or pressure, one of ordinary skill in the art would have to dispense it into a depression to keep it from running off.***

This is not logical. The medium that is of higher viscosity would have less likelihood of "running off" than a fluid medium. The medium of the claimed invention is flowable under gravity or pressure, but it forms a coherent core that dissipates only slowly. As noted earlier, the depression is to assist the sowing of the embryo/germinant to maintain the pool of nutrient medium in place.

> ***The Nutrient medium embeds solid components since the latter line the depression and will form a poool of nutrient providing an immediate support to the somatic embryos to maintain them in an unright growth orientation. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support.***

None of this is apparent from Fan et al. or Pierik taken alone or in combination. These statements are based on hindsight alone.

> ***Thus, the invention as a whole was clearly*** **prima facie** ***obvios to one of ordinary skill in the art.***

The statement is believed to be incorrect for the reasons given above. A person of ordinary skill in the art would not have been led to the claimed invention from a reading of Fan et al. and Pierik. The use of solid particles to provide continuing support and upright orientation is disclosed neither in Fan et al. nor in Pierik.

> ***Claims 21, 22, 25, 26, 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Fan et al. (United States Patent No. 6,444,467) in view of Pierik as applied to claims 1-10, 12-20, 23, 24, 27, 29-32 and 45 above and further in view of each of Gupta (United States Patent 5,563,061 1996) and of Tremblay et al. (Plant Cell, Tissue and Organ Culture 42:39-46 1995).***
>
> ***For dependent claims 21, 22, 25, 26, and 28, the prior art teaching of Fan et al. and Pierik differ from the claimed invention as follows:***

For dependent claims 21, 22, 25, 26, and 28 Fan et al. fail to teach the use of monosaccharides in the nutrient medium. Fan et al. fail to use of monosaccharides such as glucose or fructose as carbohydrate. Fan et al. also fail to teach maltose as a carbohydrate nutrient.

Again, it is pointed out that Fan et al. fail to teach several additional points over and above those outlined by the Examiner, as discussed previously.

However,

Tremblay et al. teach the use of monosaccharides (glucose and fructose), oligosaccharides and combinations of these sugars in the nutrient medium.

Gupta teaches the use of 3% of maltose in embryos culture as a carbohydrate nutrient.

It is agreed that various sugars are known as nutrients for plan species, but none have been used in flowable sowing media incorporating solid particles.

At the time the invention was made it would have been obvious for one of ordinary in the art to modify the method of Fan et al. in view of Pierik by using monosaccharides, oligosaccharides and combinations of, knowing that mixtures of simple carbohydrates as compared to monotype carbohydrate, may similarly promote or improve growth of conifer somatic germinants" (page 34). Moreover, it would have been obvious for one of the ordinary in the art to use maltose as carbohydrate in light of the fact that Gupta teaches that maltose is a growth enhancer* in vitro. ***For the above reasons, it is believed that the rejection is proper and should be sustained.

The Examiner has suggested that it would be obvious to modify the method of Fan et al. in view of Pierik by using particular sugars or combinations thereof. However, as noted in the above comments, the teaching of Fan et al. in view of Pierik does not disclose the fundamental features of the claimed invention and the further combination of the teaching of Gupta or Tremblay et al. does not make up for these shortcomings merely by suggesting various sugars as nutrient sources for tissue culture. It is therefore believed that the Examiner has not made a *prima facie* basis for the rejection of any of the cliams of this application based on the cited documents.

(10) Response to Argument

Commenting on Applicant's against obviousness in view of Fan et al. and Pierik, the Examiner commented:

> ***These elements are not persuasive because all claimed elements are cited in the prior art. Fan et al. teach a nutrient medium comprising 1-9% of sucrose (column 4, line 10), solid, liquid and gas phases (column 3, lines 62-63) for growth of somatic embryos into autotrophic seedlings.***

Here again, the Examiner has combined features from different steps of Fan et al. The sucrose solution of Column 4, line 10 relates to the pre-germination step (note that the embryo is subsequently dried). The section at Column 3, lines 62-63 relates to the sowing step. The pre-germination step is not relevant to the application under Appeal because it is not a step involving sowing. A person of ordinary skill in the art would not see the pre-germination step as relevant to the sowing step.

> ***The somatic embryo is placed in contact with said liquid medium containing*** *sucrose* ***(column 4, lines 9-11). The*** *solid* ***components are but not restricted to vermiculite ... (column 8, lines 50-51).***

The sucrose and solids in the indicated passages are used for the pre-germination step, not the sowing step.

> ***The solid components contain sufficient liquid germination medium to enable the formation of a thin capillary layer or film of germination medium around the somatic embryos (column 8, lines 52-54). The embryos are exposed to environmental conditions effective for growth (column 7, lines 63-67).***

The passage at Column 7, lines 63-67 relates to sowing, the passage at Column 8, lines 52-54 relates to pre-germination. These are unrelated steps. The solids used for pre-germination are used to prevent complete submersion of the embryos into the nutrient solution (thereby cutting off exposure to oxygen). The solid particles of the invention under appeal are used for orientation support during and after sowing.

> ***The sowing and germination steps are carried out*** ex-vitro ***in non-sterile conditions (column 7, lines 22-25, and abstract, lines 14 to 17. Fan et al. also teach sowings somatic embryos in three-phase growing medium which was irrigated or "drenched" with nutrient solutions (column 11, lines 9 -12).***

The "three-growing medium" of Fan et al. is a generic description of "growing substrates commonly used in conventional plant propagation. " (Column 9, lines 12 to 16). In other words, soil or soil-substitute may be pre-drenched with a nutrient solution before the embryos are conventionally sown. There is no use of a nutrient medium containing solid particles during sowing to provide support for the embryos/germinants.

Fan et al. teach a solid component comprising elongated particles (column 12, line 34).

The Examiner is referring to the use of a thin layer of coir, while this comprises solid (probably elongated) particles, there is no use of a flowable component. Although the sown embryos were subsequently misted with nutrient solution (Column 12, lines 36 to 39), the solid particles are not used for orientation control and the subsequent misting cannot change the orientation of the embryos or provide them with additional support.

The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (column 8, lines 50 to 54).

Once again, the Examiner is mixing statements that relate to the pre-germination step (Column 8, lines 50 to 54) with those relating to sowing (Column 12, line 34). The solids that enable the formation of a capillary layer are used for the pre-germination step. The use of elongated particles (coir) is for the sowing step. The coir is not used with a liquid (until after sowing has taken place).

Finally , Fan et al. teach growing* Pinus radiata, Pinus teada *(Loblolly pine), and* Picea glauca *(spruce) somatic embryos, which are conifer species.

No comment.

Pierik teaches nutrient media to form a gel. At the time the invention was made, it would have been obvious for one of ordinary skill in the art to modify the method of Fan et al. by mixing agar with the nutrient medium (semi-solid) knowing that gelling agent serve as binding agent for nutrient and water, thus adding this step will lower the maintenance of the germinant as no added water or nutrient will be needed. After dissipation of the mixture (nutrient, water and agar) the somatic embryos will remain in contact with the particles of the solid component having a continuing physical support.

All that Pierik shows is that agar is used to form a gel of liquid nutrient media used for *in vitro* propagation of plant tissue. A combination of this teaching with that of Fan et al. would not disclose the use of a flowable nutrient medium containing solid particles used during sowing for orientation control. Pierik does not disclose this and the methods of Fan et al. provide no such control. At best, Fan et al. merely discloses the covering over of planted embryos with a thin layer of solids. The nutrient media as

such provide no continuing physical support after sowing and this is provided only by the conventional growth substrates. This feature is entirely absent from the prior art.

> ***Fan et al. teach sowing the somatic embryos on discontinuous physical substrate (solid component) containing liquid medium. By adding agar (taught by Pierik) to the liquid medium it will raise the viscosity of the medium, thus the semi-solid medium formed will remain in contact with the embryo providing the nutrition needed for its development. After the semi-solid component (liquid medium + Agar) is fully absorbed the solid component remain to provide continued physical support for the embryos. The amount of solid component taught by Fan et al. would have the same effect as the amount of solids claimed in the present invention.***

Fan et al. fails to teach the use of a medium containing a flowable component and solid particles during sowing to provide continuing physical support. In Fan et al., a liquid medium is added to the growth substrate either before sowing or after. If done before (by "drenching"), the use of agar would impede the penetration of the medium into the growth substrate. If done after, the use of agar would prevent atomization or drenching into the solid growth substrate. Consequently, the use of agar in such conditions would lead to an inoperable modification of the methods of Fan et al.

> ***It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233; In re Reese 129 USPQ 402. Thus, absent some expectation of unexpected results from the claimed parameters, the optimization of the content of 10% solids in the medium would have been obvious at the time of Applicant's invention.***

It is not true that the general conditions of Applicant's main claims have been disclosed in the prior art. There is no disclosure of the use of a nutrient medium containing a flowable component and solid particles during sowing to provide continuing physical support and orientation control. The use of up to 10% solids is therefore not merely an optimization.

Regarding Applicants submissions regarding claim 45, the Examiner commented as follows:

> ***These arguments are not persuasive because it does not appear that the claim language or limitations result in a manipulative difference in the method steps when compared to the prior art disclosure.***
>
> ***Fan et al. teach a solid component comprising elongated particles (particles of solid component) (column 12, lines 34). The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (pool of nutrient medium) (column 8, lines 50-54). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the nutrient medium (semi-solid***

component) knowing that gelling agent serve as a binding agent for nutrient and water. One of ordinary skill in the art would have been motivated to do that because the somatic embryos will lower the maintenance of the germinant as not added water or nutrient will be needed because they will be contained in the gelling agent.

Claim 45 does result in a manipulative difference of the prior art method steps. It involves dispensing a quantity of the solids-containing nutrient medium onto the surface of a porous solid growth medium to form a pool , contacting the embryo or germinant with the pool in a manner that the pool provides physical support in the upright growth orientation, and then exposing the embryo/germinant to environmental conditions effective for growth. The dispensing of such a medium and its use for orientation control and physical support are entirely lacking from the prior art methods and are not obvious therefrom.

The remaining arguments of the Examiner are mostly a repetition of the arguments already discussed above, with the possible following exceptions.

On page 14 of the Examiner's Answer following a quotation of Appellant's argument regarding the presentation of a faulty line of reasoning regarding the combining of the teachings of Fan et al. and Pierik, the Examiner commented:

These arguments are not found persuasive because it is noted that the claimed methods recite, "comprising" which leaves the claim open for the inclusion of other steps. See MPEP 2111.03.

This comment is not understood. While the claims of the application under appeal may indeed comprise additional steps, it is Applicant's position that one or more of the steps set forth in the main claims is/are absent in the prior art. It is not seen that this would be any different if the Applicant had used "closed" claim language (i.e. "consists of").

The fact that Pierik teaches In Vitro culture instead of Ex Vitro culture has nothing to do with the fact that Pierik teaches that agar can be used as a gelling agent.

Applicant disagrees with this. While it may be known from Pierik that agar can be used as a gelling agent, it does not mean that a person of ordinary skill in the art would use such a gelling agent (known for in vitro culturing) in a medium intended for ex vitro sowing. One involves use in a laboratory setting and the other involves commercial planting in plant-growing conditions. Such different environments would not make it obvious that properties useful in one would be effective in the other. The context of the disclosure cannot be overlooked. Moreover, the impossibility of using agar in the method of Fan et al. has already been addressed.

On page 16 of the Examiner's Answer, reference is again made to the use of the word "comprising" in the claims. The Examiner stated, after quoting Appellant's comments on the patentability of claims 21, 22, 25, 26 and 28 particularly regarding Gupta and Tremblay et al., as follows:

> ***These arguments are not persuasive because it is noted that the claimed methods recite, "comprising" which leaves the claim open for the inclusion of other steps. See MPEP 2111.03. Fan et al. teach a process of producing somatic seedlings from a somatic embryo. The process may be carried out using conventional seed handling equipment. The process does not require the use of aseptic techniques or sterilized media or equipment (ex-vitro)(Fan et al. abstract). The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant. ... Although Ex parte levengood ... states that obviousness cannot be established by combining references "without also providing evidence of the motivating force which would impel on skilled in the art to do what the patent applicant has done" (emphasis added), reading the quotation in context it is clear that while there must be motivation to make the claimed invention, there is no requirement that the prior art provide the same reason as the applicant to make the claimed invention. ...***
>
> ***In this case, the motivation of combining the teaching of Fan et al. with the teaching of Pierik is to lower the maintenance of the germinant as no added water or nutrient will be needed because they will be contained in the gelling agent, which will adhere to the somatic embryos. The motivation of using 10% of solid component would be to use this percentage to help the most of the nutrient to stay in contact with the embryos, thus giving more usefulness to the method. One would have been motivated to use this percentage of solids in the medium to optimize the surface of the embryos in contact with the nutrient and to keep a continuing support to the somatic embryos after dissipation of the mixture (nutrient, water and agar).***

The "motivations" suggested by the Examiner do not hold up to scrutiny. As already mentioned:

1. The addition of agar to the nutrient solutions of Fan et al. used for the sowing step would prevent drenching, atomization or other application method suggested. The claims of the present application require dispensing of the solids-containing nutrient medium onto the surface of a growth substrate where it remains. The intention of Fan et al. is to soak the substrate with the nutrient medium either before or after sowing. This cannot be done if there is a gelling agent in the medium.

2. The motivation of "no added water or nutrient will be needed" is incorrect. In growing conditions, added water will certainly be needed at some time. The gelling agent may prolong the contact of the embryo with the nutrient and water in the medium, but further watering will be required.

3. The motivation of using 10% solids "to help the most of the nutrient to stay in contact with the embryos, thus giving more usefulness to the method" is not self-evident. There is no suggestion

of the use of a solid in a nutrient medium used for sowing in either Fan et al. or Pierik. There would therefore be no motivation to limit the amount to 10%.

***The motivation of combining the teaching of Fan et al. with the teaching of Gupta and further with the teaching of Tremblay et al. would be that a person having ordinary skill in the art would have known "that mixtures of simple carbohydrates as compared to monotype carbohydrate, may similarly promote or improve growth of conifer somatic germinants (page 34 of the specification). Moreover, it would have been obvious for one of ordinary skill in the art to use maltose as carbohydrate in light of the fact that Gupta teaches that maltose is a growth enhancer* in vitro.**

Applicant points out that Gupta and Tremblay et al. do not show the use of such carbohydrates during the sowing and growing of embryos/germinants. Tremblay et al. relates to embryo maturation. Gupta uses maltose in steps up to embryo maturation. A person of ordinary skill in the art would recognize that the various stages of embryo development and subsequent sowing all require specific and generally quite different methods, materials and conditions. There can be no assumption that a chemical used for one stage would be effective for another.

Finally, the Examiner stated on page 17 of the Examiner's Answer following a quotation of Applicant's remarks regarding claim 45, that:

Fan et al. teach a solid component comprising elongated particles (particles of a solid component) (column 12, line 34). The solid components contain sufficient liquid germination medium to enable the formation of a capillary layer of medium around the somatic embryos (pool of nutrient medium) (column 8, lines 50-54). It was obvious to modify the method of Fan et al. by adding agar (taught by Pierik) mixed with the nutrient medium (semi-solid component) knowing that gelling agent serve as biding agent for nutrient and water.

Again, Fan et al. do not teach a solid component within a nutrient medium used during sowing. The statement regarding the formation of a capillary layer relates to the medium used for pre-germination and not for sowing. It is not obvious to modify Fan et al. by adding agar because this would prevent the modes of use of nutrient medium used during sowing. This is as discussed above.

In addition to this, there is absolutely no reference in any prior art document to the use of a nutrient medium to provide a generally upright growth orientation and to maintain the upright growth orientation through continuing physical support after the flowable component of the nutrient medium has dissipated.

For these reasons, it is believed that the Examiner's Answer is incorrect and that the claims of the present application should be considered patentable.

Respectfully submitted,

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